

Utilization of Waste Crumble of Steel in Autoclaved Aerated Concrete Construction

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Abstract— In the past few years use of Autoclaved aerated concrete (AAC) is growing tremendous and much research and modification has been done to produce Autoclaved aerated concrete which has the desired characteristics. Autoclaved cellular concrete has a very flexible system and it is one of the best materials for construction to reduce CO₂ emission from manufacturing process of brick is commonly used building material for construction. Therefore, focus should be now more on eco-friendly solutions for greener environment and direct path to sustainable development. This research demonstrates the use of waste crumble of steel and fly ash as replacement of sand in autoclaved aerated concrete. Material was produced, tested and compared with normal autoclaved aerated concrete and regular concrete in terms of strength these tests are carried out on standard cube, beam and cylinder for 7 and 28 days to determine the compressive strength, tensile strength, flexural strength. From the obtained results for 7 and 28 days, it may be concluded that, crumble of steel is suitable for the production of autoclaved aerated concrete. Due to the properties of steel high strength of AAC products are achieved.

Key words: AAC, Waste Crumble of Steel, Fly ash

I. INTRODUCTION

A. General

Steel is one of the most important materials in the world. In the recent year, the expanding urbanization and increasing demand for construction materials. It has directly or indirectly caused to the environment & health problems. The environment pollution from the operations of bricks making is injurious for animals, human health and plants life. Also the pollution of environment from operations of bricks making contributes to the global warming and climatic change. Various types of concrete products can be used as an alternative to the red bricks, to reduce environmental pollution and global warming & climate change. Autoclaved aerated concrete may be one of the solutions for brick replacement. Autoclaved Aerated Concrete is eco-friendly & green building materials, Also it is lightweight, load-bearing, high insulating, durable building product. AAC increase the building quality with reducing costs of construction. The Autoclaved Aerated Concrete was invented by Sweden Architect Johan Axel Eriksson in year 1924. It has one of the most used building materials in Europe also it is rapidly growing in many other countries around the world. Autoclaved aerated concrete block is produced from the mix of pulverized fly ash, cement, lime, gypsum, steel crumble, aluminum powder. Due to its excellent properties the Autoclaved aerated concrete products is used in the construction of building, such as in residential homes, industrial, commercial, schools, hospitals, hotel buildings, etc. Autoclaved aerated concrete contains 50 - 60 % of air for leading light weight and low thermal conductivity.

B. Aim and Objective

The paper is aimed to Utilization of Waste Crumble of Steel in Autoclaved Aerated Concrete Construction. The final objective of the paper is the protection of concrete structures by formation of cracks in building structure. One of the reason for that the overload on the building structure due to use of various machinery's, equipment's and other appliances.

While attaining the objective of the research activity will also give,

- 1) Reduce CO₂ emission from manufacturing process of brick and propagate the harmful effect to environment due to red clay bricks.
- 2) Overcome diagonal splitting, structural limitations like poor shear, potential damages and create a suitable environment for construction industry.
- 3) Enhance the use of crumbles of steel an industrial waste, as an ingredient of construction industry.

C. Various Materials for Advance Autoclaved Aerated Concrete

- 1) Cement- Portland pozzolana cement is generally preferred.



Cement-27%

- 2) Crumble of steel- crumble of steel waste is easily available in the steel industry.



Crumble of steel- 3.5%

- 3) Water- Portable water should be used which should conform to general requirements of the concrete.



Water as per requirement

- 4) Fly ash - A by-product of thermal power plants and is an important raw material in the manufacture of Autoclaved Aerated Concrete.



Fly Ash – 65%

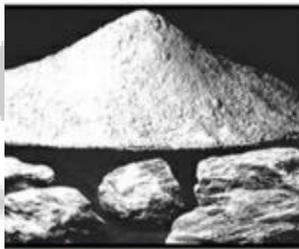
- 5) Aluminum Powder - It is easily available in the aluminium manufacturing industry.



Aluminum Powder-0.5%

- 6) Lime - Lime powder is obtained either by crushing lime stone factory or by directly purchasing it from the market.

- 7) Gypsum - Gypsum is easily available in the market and is used in powder form. It is stored in silos.



Lime & Gypsum-7.5%

D. Properties of Raw Material

Parameters	Fly Ash
Bulk Density (gm/cc)	0.9-1.3
Specific Gravity	1.6-2.6
Plasticity	Lower or non-plastic
Shrinkage Limit (Vol stability)	Higher
Grain size	Major fine sand/silt and small per cent of clay size particles.

Table 1: Properties of fly ash

Fineness of cement	1.5%-2%
Soundness	2 mm
Standard consistency	35%
Initial setting time	90 minutes
Final setting time	270 minutes

Table 2: Properties of cement

II. METHODOLOGY

The collection of various raw materials are collected from related industries i.e., crumble of steel and aluminum powder are collect from steel and aluminum cutting workshops and cement, fly ash, lime, gypsum are collect from there industries. Size of cube 150X150X150 in mm.

A. Stages of Project Research

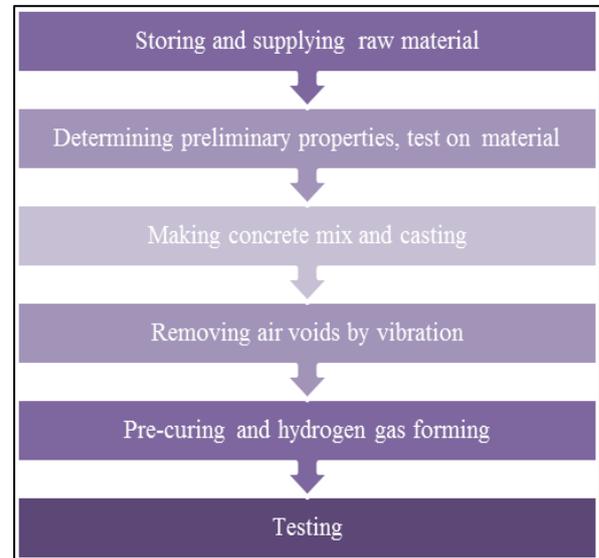


Fig. 1: Stages of project work

B. Test Result

Sr. No.	Average Load (KN)	Area (mm ²)	Compressive Strength (N/mm ²)
1	221 KN	22500	9.82
2	284 KN	22500	12.62
3	311 KN	22500	13.82

Table 3: Compressive strength test report of cubes at 28 days

III. CONCLUSION

From the above result we concluded that, The compressive strength of this concrete cubes at 28 days is achieved more than regular autoclaved aerated concrete blocks and hence it can be Overcome diagonal splitting, structural limitations like poor shear, potential damages and create a suitable environment for construction industry. We analyzed the suitable type of aerated concrete products for construction sector. By using the waste crumble of steel in cellular concrete, the strength of concrete increased, hence the selection of additional material (i.e., crumble of steel) is best for the construction of cellular concrete, also we can reduce the harmful effect due to CO₂ emission from manufacturing process of red clay bricks to the environment. We can replace natural sand by crumbles of steel to create a suitable environmental conditions on earth.

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